

**Neuron, Volume 61
Supplemental Data**

**State-dependent spike timing relationships between
hippocampal and prefrontal circuits during sleep**

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Supplemental Figures

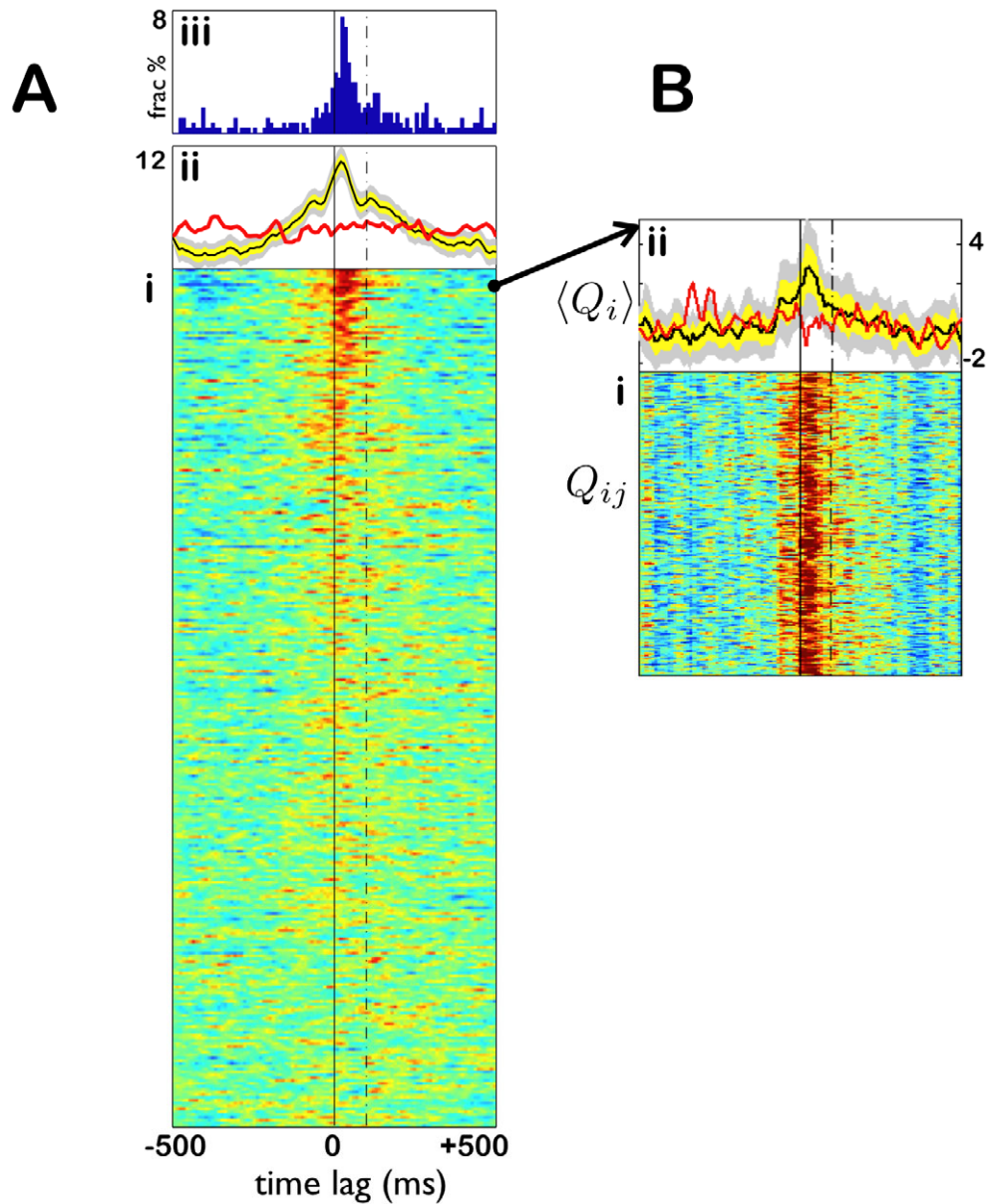


Figure S1: **Randomization procedure for testing the effect of unequal sample sizes in SWS versus REM.** **A:** (i) Each row shows the standardized cross-covariance of a cell pair averaged over 1000 random subsets of SWS of the same length as REM. Rows are in the same order as in Fig. 3A(i). (ii) The black curve shows the standardized mean cross-covariance averaged over all SWS subsets; colored bands show 1- and 2-standard deviations around the mean. The red curve shows the standardized mean cross-covariance during REM, which differs significantly from the distribution of standardized mean cross-covariances over random SWS subsets. (iii) The distribution of peak lags in (i) for the same cell pairs as in Fig. 3A(iii). **B:** All 1000 cross-covariances from random subsets of SWS for the example cell pair indicated by the arrow, ordered by the total number of spikes in the SWS subset for that pair. Note that the significant cross-covariance identified using all of SWS is clearly visible in most REM-sized subsets of SWS.

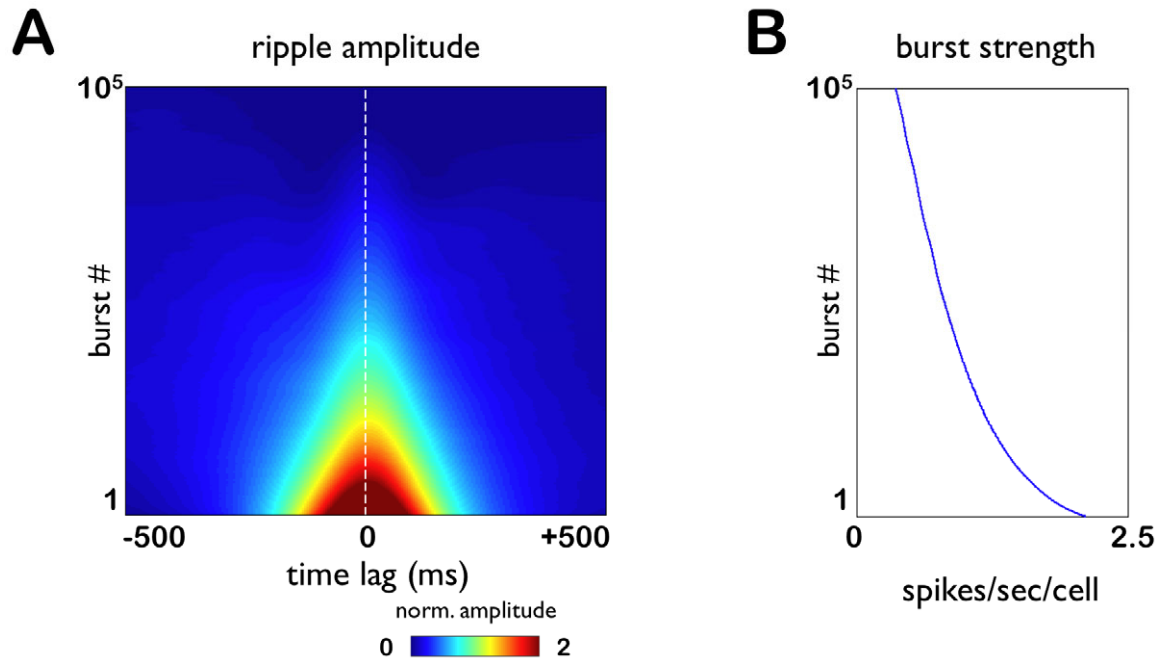


Figure S2: **Relationship between burst strength and ripple band power.** **A:** Mean standardized amplitude of ripple band activity in the pyramidal cell layer of CA1 for each of the bursts in Fig. 8A(i) (see Methods), smoothed using the same parameters. Note that ripple band amplitudes are peaked around burst times and grow with increasing spikes/sec/cell (burst strength). **B:** The corresponding burst strengths for the same bursts in **A**.

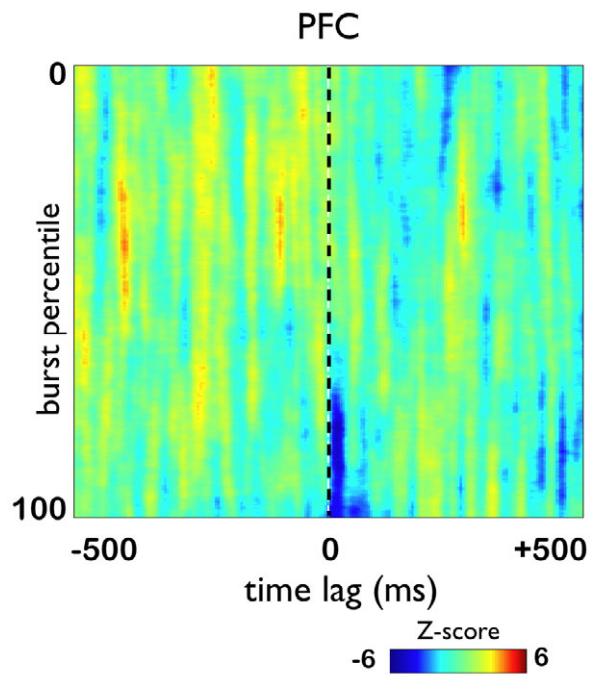


Figure S3: **Inhibitory prefrontal responses to CA1 bursts.** Standardized prefrontal responses to CA1 bursts sorted by burst size, calculated in the same manner as Fig. 8B(i), for dataset 3. Note the inhibitory short latency response that grows with burst size.